WARD BRAZOS RIVER BRIDGE
Texas Historic Bridges Recording Project
Spanning Salt Fork of Brazos River
at County Route 109
Aspermont Vicinity
Stonewall County
Texas

HAER No. TX-67

BLACK AND WHITE PHOTOGRAPHY

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C St., NW
Washington, DC 20240

HAER
TEX
217-ASPER.V
1-

HISTORIC AMERICAN ENGINEERING RECORD

WARD BRAZOS RIVER BRIDGE

HAER No. TX-67

Location:	Spanning Salt Fork of the Brazos River at County Route 109, Aspermont vicinity, Stonewall County, Texas. UTM: 14/375020/3685550 USGS: Lovers Resort, Texas, quadrangle (1981).
Date of Construction:	1935.
Designer:	Missouri Valley Bridge and Iron Company, Leavenworth, Kansas.
Builder:	H. H. Shadle.
Present Owner:	Stonewall County.
Present Use:	Vehicular bridge.
Significance:	The Ward River Bridge is a 787'-7"-long, eleven-span truss bridge crossing the Salt Fork of the Brazos River's wide flood plain. The structure employs eight spans of pin-connected Pratt pony trusses and three spans of riveted and bolted Warren pony trusses. These spans, some or all of which were purchased from another county, reflect the portability of trusses manufactured by bridge companies. It is the only known remaining bridge in Texas employing a combination of Pratt pony and Warren pony spans.
Historian:	Estella M. Chung, August 1996. Revised by Justin M. Spivey, September 1998.
Project Information:	This document was prepared as a part of the Texas Historic Bridges Recording Project performed during the summer of 1996 by the Historic American Engineering Record (HAER). The project was sponsored by the Texas Department of Transportation (TxDOT).

Introduction

The Ward Brazos River Bridge does not strike the traveler as a man-made structure placed in the landscape. Repeating simply supported spans, just a few feet above the flood plain, place the traveler close to rugged shrubs, grass, and low trees. Because of the pony truss configuration, the skyscape is uninterrupted by overhead bracing. The bridge enhances the experience of crossing the Salt Fork of the Brazos River.

The Salt Fork winds through the arid landscape of Stonewall County in north central Texas, turning abruptly between north and east. Many roads follow the outline of its broad, shallow flood plain; the Ward Brazos bridge is one of few widely spaced crossings in the rural northwestern part of the county. Some or all of its eleven spans were purchased from Menard County, about 150 miles to the south, reflecting the portability of metal truss bridges manufactured by bridge companies.

History of Structure and Site

The northwestern part of Stonewall County was settled in the late nineteenth century. When the Ward River Brazos Bridge was built in the early twentieth, the county was a rural agricultural area. Roughly half of the farmers owned their farms, while the other half were tenant farmers.[1] The bridge was built on a local road which connected residences to Swenson and Aspermont, the county seat. At present, the use of the bridge remains relatively unchanged, spanning between two ranches in a sparsely populated area.[2]

Texas Department of Transportation records indicate that the eight pin-connected Pratt pony spans were built in 1916 by the Missouri Valley Bridge and Iron Company.[3] The company, founded in 1876 by M. H. Insley, A. J. Tullock, and D. Shire, operated out of Leavenworth, Kansas.[4] Typical of bridge companies in the late nineteenth and early twentieth century, agents bearing catalogs of designs sold bridges to local governments, often distant from the manufacturer. The basis for the 1916 date is uncertain, so the spans may or may not be original to the site, or even the county. Given the ease of assembling pin-connected trusses designed for

---

[1] Stonewall County Historical Commission, *A History of Stonewall County* (Aspermont, Texas, 1979).

[2] According to U.S. Census figures, the population of Aspermont was 1,214 in 1990.

[3] Texas Department of Transportation, Texas Historic Bridge Inventory form, Bridge No. AA01-09-001, June 8, 1987 (Environmental Affairs Division, TxDOT, Austin, Texas).

[4] Victor Darnell, *A Directory of American Bridge-Building Companies 1840-1900,* Occasional Publication No. 4 (Washington, D.C.: Society for Industrial Archaeology, 1984), p. 17.

inexpensive shipping and erection, they could have been just as easily disassembled and moved onto the site.

An index to Stonewall County Commissioners' Court minutes indicates that H. H. Shadle was given a contract to build a Missouri Valley-fabricated bridge across the Salt Fork on December 13, 1916; however, it is not specifically referred to as the Ward crossing and may therefore be a different bridge.[5] This bridge construction contract was one of four awarded to Shadle in 1915 and 1916.

Shadle was still active in Stonewall County when, on April 8, 1935, he was awarded a "contract for construction" of the "Ward Brazos River Bridge".[6] For $5,500.00 he agreed "to furnish equipment, lumber, cement, supervision, and everything, except steel for spans, and Roy Mullen to haul the above supplies to bridge site." On June 10 of that year, the Stonewall Commissioners Court purchased steel for $2,000.00 from Menard County.[7] The index indicates that "steel spans" were purchased; these were probably the eight Missouri Valley-fabricated Pratt trusses currently at the site.[8] The three Warren spans, made from sections rolled by the Phoenix Iron Company of Phoenixville, Pennsylvania, might have been from a different bridge in Menard County also purchased in the same lot.

Pratt and Warren Trusses

The Ward River Bridge employs both Pratt pony and Warren pony truss spans. The significance of both truss types is in their simplicity of design, practicality, and widespread use. As historian Carl Condit explains, "the most striking single feature of the twentieth-century truss bridge is the almost universal acceptance of Pratt and Warren trusses for both rail and highway spans."[9]

Both Howe and Pratt trusses are divided into rectangular panels each crossed by two diagonals. Whereas the Howe truss carries loads with diagonals in compression and verticals in

---

[5] Stonewall County, *Index to Commissioners' Court Minutes,* No. 3 (Stonewall County Courthouse, Aspermont, Texas), p. 100.

[6] Ibid., p. 24.

[7] Stonewall County, *Commissioner's Court Minutes,* vol. 5 (Stonewall County Courthouse, Aspermont, Texas), p. 204 (April 8, 1935), p. 206 (June 10, 1935).

[8] *Index to Commissioners' Court Minutes,* No. 3, p. 24.

[9] Carl W. Condit, *American Building Art: The Twentieth Century* (New York: Oxford University Press, 1961), p. 82.

tension, the Pratt truss' shorter verticals are less likely to buckle under compression.[10] The Pratt form was created by Thomas Pratt, probably around 1842; he and his father Caleb patented it in 1844.[11] The Ward Brazos River Bridge employs a variant Pratt form with inclined end posts which, as extensions of the top chord, carry compressive forces.

To facilitate transportation of truss parts from factory to site, and reduce the number of critical alignment points during assembly, bridge company designers chose pinned connections. Pinned connections, though preventing horizontal and vertical movement at joints, do little to prevent rotational movement. This has the added benefit of simplifying structural calculations, since one less equation of equilibrium must be solved to determine the forces acting at each joint.

James Warren and Willoughby Monzani, two British engineers, patented the Warren truss in 1848. Their original design was divided into equilateral triangles, thus requiring only one length of member. American engineer Squire Whipple built a truss of the Warren form in 1849 or 1850, supposedly "without knowledge of its English precedent."[12] Although the simple equilateral form was intended for economical fabrication, variants including vertical posts or double-intersection diagonals were soon developed. The Ward Brazos River Bridge employs Warren trusses with verticals in alternate triangles.

Although pin-connected trusses were easy to assemble, American engineers eventually adopted the fixed connections which, because of their greater rigidity, were widely used in Europe. Fixed connections restrain rotational movement, therefore avoiding the problem of pins wearing out and eventually causing excessive deflection if not collapse.

Description

The Ward Brazos River Bridge has eleven spans with a total length of 787'-7". From its south end, eight pin-connected Pratt trusses are followed by three riveted and bolted Warren trusses. Drawings and photographs accompanying the TxDOT bridge inventory indicate that the vertical clearance underneath once ranged from three feet at the abutments to fourteen feet where the Salt Fork of the Brazos River passed under the Warren spans. However, attesting to the earth-moving capabilities of Texas rivers, the ground is presently just several feet beneath the Warren spans and the river passes beneath Pratt spans No. 4 through 6.

Concrete piers 2'-6" square, joined by a 1'-0"-thick wall for a total width of 19'-7", support the eight pin-connected Pratt truss spans and the adjacent Warren truss' south end. The concrete piers terminate below the trusses' lower chords, with the remaining height filled by

---

[10] David Plowden, *Bridges: The Spans of North America* (New York: Viking Press, 1974), p. 40.

[11] Condit, *American Building Art: The Nineteenth Century* (New York: Oxford University Press, 1961), p. 110.

[12] Ibid., p. 117.

short steel columns. These stub columns are comprised of two 11 1/2"-deep channels laced together. At one end of each truss, the chords are pinned directly into the stub columns. To accommodate longitudinal expansion and contraction, the opposite ends rest upon roller nests supported by brackets attached to the short steel columns. The Warren spans are supported by steel bents: a horizontal H-section measuring 12 1/8" x 9 3/4" and 5/8" thick spans three columns of the same dimensions, diagonally braced by 3-inch angles.

Spans No. 1 through 8 are four-panel pin-connected Pratt pony trusses with inclined end posts. The 8'-5"-tall Pratt trusses are either 64'-6" or 65'-4 1/2" long, measured end to end. The upper chord is a box section formed from two channels, facing back to back, with single lacing on the bottom and a solid 12"-wide plate on top. Verticals, two angles riveted to a plate at either end, support the floor beams just above the lower-chord eyebars. Members U1-L2 and U3-L2, the primary tension-carrying diagonals, are two rectangular eyebars; counters U2-L1 and U2-L3 are rods with a turnbuckle. Crossed 7/8"-diameter rods below the deck provide lateral bracing in each panel. The 15"-deep I-section floor beams, riveted onto the verticals at either end, support 7"-deep I-section stringers weighing 15.3 pounds per lineal foot (lb/ft). The outermost stringers are 7"-deep channels at 9.8 lb/ft. Atop the stringers is a 3"-thick deck of timber planks. The clear roadway width is 14'-8 1/2" between 6"-wide curbs.

This same roadway construction continues onto three spans of riveted and bolted Warren trusses. Span No. 9 is 89'-2 1/4" long, No. 10 is 89'-4 1/4", and No. 11 is 89'-6", measured end to end. Each truss is divided into five panels. Steel members bear the mark "PHŒNIX," indicating that they were rolled at the Phoenix Iron Works in Phoenixville, Pennsylvania. All connections are made by gusset plates, with a combination of riveting and bolting. The bridge manufacturer likely attached some plates in the shop by riveting, leaving the remainder of connections to be made by bolting in the field. This reduced the amount of labor and skill required to assemble the structure on site.

Ten-inch-deep I-beams, placed with webs horizontal, form the upper chord; inspection reports indicate these members weigh 25.4 lb/ft. The diagonals and verticals are built up to match the upper chord's width, from two angles with legs facing inward and attached by riveted rectangular plates. Diagonals in panels one and five are 3 1/2" angles at 4.9 lb/ft; in two and four, 3" angles at 4.5 lb/ft; and in panel three, 2 1/2" angles at 3.62 lb/ft. Verticals consist of 2 1/2" angles at 3.19 lb/ft. The lower chord is formed of two angles attached back-to-back outside the gusset plates, 3" at 4.5 lb/ft for the outermost two panels and 5" at 8.7 lb/ft for the inner three. The floor beams, 12"-deep I-sections at 31.8 lb/ft, are suspended by four channels from each lower-chord panel point. Lateral bracing under the deck consists of 1"-diameter crossed rods. Eight 8"-deep I-section stringers at 18.4 lb/ft support the aforementioned timber roadway.

Conclusion

The Ward Brazos River Bridge's unusual combination of Pratt and Warren spans not only reflects the practical re-use of metal truss bridges on a rural site, but also indicates a change in

bridge-building technology. Its eight pin-connected Pratt spans were designed for easy transportation and assembly. While its three riveted and bolted Warren spans were also designed for a minimum of skilled labor for on-site assembly, gusset-plate connections reflect a desire for greater structural rigidity. The two truss forms are combined to cross the Salt Fork's broad flood plain in a setting which has changed little since.

SOURCES CONSULTED

Bridge Company Files. Texas Department of Transportation, Austin, Texas.

Condit, Carl W. *American Building Art: The Nineteenth Century.* New York: Oxford University Press, 1961.

_____. *American Building Art: The Twentieth Century.* New York: Oxford University Press, 1961.

Darnell, Victor. *A Directory of American Bridge-Building Companies 1840-1900.* Occasional Publication No. 4. Washington, D.C.: Society for Industrial Archaeology, 1984.

Plowden, David. *Bridges: The Spans of North America.* New York: The Viking Press, 1974.

Stonewall County, Texas. *Commissioners' Court Minutes.* Stonewall County Courthouse, Aspermont, Texas.

_____. *Index to Commissioners' Court Minutes.* Stonewall County Courthouse, Aspermont, Texas.

Stonewall County Historical Commission. *A History of Stonewall County.* Aspermont, Texas, 1979.

Texas Department of Transportation. Texas Historic Bridge Inventory form, Bridge No. AA01-09-001, June 8, 1987. Environmental Affairs Division, TxDOT, Austin, Texas.